

Ecology-oriented House Builders and FSC-certified Domestic Timber in Japan

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Abstract Forest owners' cooperatives are one of the leading organizations in the forest sector in Japan. Yusuhara Forest Owners' Cooperative (YFOC) in Kochi Prefecture is one of such examples, which obtained FSC forest certification as a resource manager of the forest, which belongs to more than 1,200 small-scale forest owners. YFOC has successfully expanded sales of FSC-labeled timber in recent years. Most of their certified timber is purchased by house builders in urban cities including Osaka. This paper analyzes who desires FSC-certified timber from YFOC and why. Six case studies are reported, which reveal that ecology-oriented house builders are interested in using FSC certified timber because of traceability of the timber, price advantage from direct dealing, environmentally sound forest management of YFOC, and relatively high quality of the timber.

Keywords Certified timber · Forest certification · Forest owners' cooperative · Post-and-beam method · Sick house syndrome · Yusuhara

Introduction

With 66% of forest coverage of the land surface, Japan is one of the most densely forested countries in the world. Having 10 M ha of softwood plantations, which compose over 40% of total forestland area, forest inventory is approaching 4.4 billion m³ and is still growing. One can say that Japan is rich in forest resources. However, the forest industry in Japan has been shrinking for decades. In early 1960s, the Japanese government decided to open up the timber market—i.e. to begin free trade of logs and sawn timber—and import of wood fibre has increased since

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then. Domestic forestry had suffered from competition by less expensive overseas logs and timber, and timber production volume has decreased gradually.

After the 1990s, some domestic timber became competitive against imported timber in terms of price, mainly due to mechanization of the harvesting system and promotion of commercial thinning. However, timber production has decreased because of stagnation of overall wood consumption and insufficient kiln drying facilities for domestic timber for housing, to a current level of 17 M m³ per year, or about one quarter of the level of 40 years ago, with self-sufficiency of about 20%.

In such difficult circumstances, only a few timber companies and forest owners' cooperatives are working hard to improve the gloomy situation. Yusuvara Forest Owners' Cooperative (YFOC) in Kochi Prefecture is one of the examples of such organizations. YFOC received Forest Stewardship Council (FSC) certification in 2000, and has been expanding its economic activity by exploring new distribution channels for certified timber (Ota 2007).

Forest certification is not yet popular with Japanese people. FSC-labeled products are not common in do-it-yourself (DIY) shops, furniture stores, stationers or department stores. It is difficult to obtain FSC-labeled timber. At the same time, it is difficult for suppliers of certified products to sell their products. For these reasons, YFOC began direct sales to house builders who desired FSC-labeled timber.

One of the most popular issues of interest concerning forest certification and marketing of certified wood products is whether a price premium can be obtained for certified wood products. Some studies analyzed willingness to pay additional money for certified wood products, and revealed the possibility of existence of consumers prepared to purchase certified wood products at higher prices (Grönroos and Bowyer 1999; Veisten 2002). However, existence of premium prices for certified wood products is not reported often in the real market. Sedjo and Swallow (2002) examined economic rationality for producers of having forest certification using partial equilibrium modeling. They concluded that a price premium will not arise in the market even though some customers are willing to pay more for such products.

Some literature exists on researchers testing for price premiums for certified wood products in the Japanese domestic market. Most have found no significant price difference between certified and non-certified products (Ota 2005; Takahashi 2006). However, some studies have found that forest certification brings positive effects other than direct economic advantages, including high reputation of the company, increasing of traceability of products, environmental awareness of employees and forestry workers, expansion of the market, and improving the relationships between forest owners and rural society (Iwaisako and Sato 2005; Okada 2005; Ota 2006).

This paper analyzes what kind of builders desire FSC-certified timber from YFOC and why. The paper explores the recent situation that traditional wooden house builders in urban areas are willing to use FSC-certified timber. In a previous paper in this journal, the author examined how YFOC developed the new distribution channel and expanded their timber sales. This paper focuses on the other side of the business, i.e. house builders as buyers of FSC-certified timber from YFOC.

Tradition and Recent Trends of Wooden Housing

As represented by Horyuji Temple, the oldest wooden construction in existence at 1,300 years of age, wooden construction is the tradition of Japanese culture. Buildings such as Pagoda in Horyuji are proof that a sophisticated method of wooden construction was already established in Japan at that time. Timber was the primary material for construction, being abundant in the Japanese islands. Castles in the Middle Ages—for example the 31.5 m high Himeji Castle with its six stories on a stone wall, which was built in 1601—provide impressive examples of wooden structures build using traditional construction methods. Almost all buildings and houses in Japan were made of wood until late 19th century when the western influence came.

Wooden houses are adaptable to the Japanese climate. In the west of the country, where most of the population settled in ancient times, the climate is characterized by a long summer with hot and humid air. Japanese wooden houses are suited to such a climate. Post-and-beam construction with board or clay walls is the original style. It is cool inside because of good ventilation and weak insulation.

Wooden houses are still highly popular in Japan. Table 1 shows the number of wooden and non-wooden newly built houses in 2006. Because of the large number of flats or apartment houses built with non-wood materials in urban areas, only 43.3% of new dwellings construction is wooden. However, most individual houses (84.9%) are made of wood, reflecting the strong preference of Japanese people for living in wooden houses. There are many skyscrapers and concrete buildings in metropolitan areas including Tokyo and Osaka, but most of individual houses in suburbs and rural areas are made of wood even today.

There are several methods of wooden house construction in Japan. The post-and-beam method is the most common, other new wooden construction methods being the 2×4 method and pre-fabrication. The 2×4 or platform construction method is imported from North America, and involves use of 2 inch \times 4 inch wooden studs. Almost all wooden houses and flats in USA are constructed by this method, which is easy to apply and high in thermal insulation, and provides strength against earthquakes. The most important characteristic in 2×4 method is the thick wall full of insulators, which is well suited for dry inland climates with large daily and seasonal temperature changes. The pre-fabrication method is an application of 2×4 in which some components, particularly walls or compartments, are assembled at the factory. As shown in Table 2, the proportion of these two new methods, especially of 2×4 , has increased in recent years. Nevertheless, nearly

Table 1 Number of newly constructed housing in Japan (2006)

Construction material	Individual houses	Terraced houses	Flats	Total
Wooden	426,730 (84.9%)	62,977 (72.8%)	69,494 (9.9%)	559,201 (43.3%)
Non-wooden	76,155 (15.1%)	23,510 (27.2%)	631,525 (90.1%)	731,190 (56.7%)
Total	502,885 (100%)	86,487 (100%)	701,019 (100%)	1,290,391 (100%)

Source: Construction Research Institute (2007)

Table 2 Newly constructed wooden housing by methods in Japan (1990–2006)

Construction method	1990	1995	2000	2005	2006
Post-and-beam	642,102 (88.2%)	554,690 (83.3%)	446,359 (80.3%)	426,299 (78.5%)	432,731 (77.4%)
2 × 4 Method	51,093 (7.0%)	73,989 (11.1%)	79,114 (14.2%)	95,824 (17.7%)	105,390 (18.8%)
Pre-fabrication	34,570 (4.8%)	37,445 (5.6%)	30,341 (5.5%)	20,725 (3.8%)	21,080 (3.8%)
Total	727,765 (100%)	666,124 (100%)	555,814 (100%)	542,848 (100%)	559,201 (100%)

Source: Construction Research Institute (2007), Forestry Agency (2007)

80% of wooden houses are still constructed by the traditional post-and-beam method.

Due to increased community desire for air conditioning in houses, high house insulation has become increasingly important in Japan, which is one reason why 2×4 houses have become popular. On the other hand, wall insulation has been introduced in the post-and-beam construction, instead of traditional board or clay walls. Post-and-beam with clay is called the 'real wall' method, whereas that having internal insulation materials is called the 'big wall' or 'flame and covered wall' method. The big wall must represent progress in one way, but in another sense reflects disintegration of the traditional housing method.

Traditional Japanese wooden houses are built totally with natural materials. However, houses today use many artificial or non-biodegradable materials, including plastics, petroleum-based paints and chemical adhesives. The big wall and 2×4 methods are criticized for containing so many chemical components, including plywood, OSB, laminated lumber, wall paper and a variety of chemical adhesives.

The so-called *sick house syndrome* has been a hot issue in recent years in many industrialized countries, including Japan. Volatile chemical components from new houses cause some allergic reaction of dwellers. This is why allergy-sensitive people wish to live in houses constructed with natural materials. Aware of these issues, some house builders are trying to build houses without non-biodegradable materials. The ecology-oriented housing movement is gradually expanding, and the traditional post-and-beam method with 'real wall' is undergoing a resurgence.

Gradual Expansion of FSC Certification and Yusuvara Forest Owners' Cooperative

The FSC forest certification system was created in 1993. There was no similar system in Japan at the time, and forest owners took years to understand the meaning of the system and to seek certification. The first forest in Japan certified by FSC was in 2000, and after that the area has been gradually expanding, as illustrated in Fig. 1. Presently, there are 28 organizations which have obtained FSC forest certification in Japan, and the total area of certified forest is 282,000 ha, or a little over 1% of total forest land in the country. Most of the organizations are timber companies, forest owners' cooperatives and municipalities.

YFOC was certified by FSC in October 2000. It was the second organization in the country and the first as a resource manager or group certification. It is one of laudable examples of a forest owners' cooperative demonstrating an environmentally sound way in forest management under the severe condition of domestic forestry.

Yusuvara is a remote mountainous town on Shikoku Island with the population of 4,011 as of April 2009. About 90% of the land surface, or over 21,000 ha, is forested, of which 16,000 ha is softwood plantation. Most of the forest land has a slope of 30% or more. Such a geological situation is not unusual in Japan, but most steep-land municipalities are depopulated, with contracting forestry, agriculture and

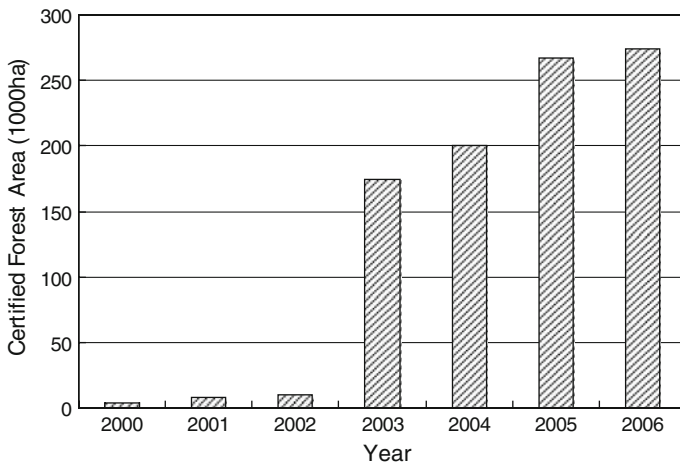


Fig. 1 Trend of FSC certified forest area in Japan (2000–2006). *Source:* Forest Stewardship Council (2008), Forest Stewardship Alliance (2008)

other economic activities. Yusuvara is an exception, and people there are highly active in developing forestry and agro-tourism.

FSC forest certification became a trigger for expanding forest production. Most of the forest owners are participating YFOC, and this cooperative represents the forest sector in the town. More than 1,200 members of YFOC have joined the FSC certified group, and the certified forest area is 11,371 ha. YFOC runs a small sawmill, and processes timber to add value to the products from members' forest land.

During 2000–2002, FSC certified logs and timber were in low demand, because FSC was not popular with buyers. The situation slowly turned around after 2003, as new customers were found who wanted FSC-labeled timber. Relatively small construction companies and house builders began to order FSC-labeled timber from YFOC. The YFOC sawmill previously wholesaled their products mainly to timber auction markets and wholesalers, with little direct dealing with house builders. Because house builders require timber of many dimensions but in small amounts, such direct dealing was highly complicated and difficult. Therefore, direct dealing was a new challenge for YFOC.

YFOC has been expanding direct dealing with house builders with continuous efforts since 2003. In 2000, more than 70% of YFOC sawmill products were sold to either wholesalers or auction markets, and only 18% were sold directly to house builders. Direct sales to builders rose to 40% in 2004 and 71% in 2005. House builders became major buyers of YFOC timber, and demand of FSC-certified timber appeared likely to exceed their supply capacity. In response, YFOC decided to expand their sawmill capacity, introducing a new twin-band saw, circular saw and planer, and constructing two kilns (Ota 2006).

As shown above, YFOC is a successful example of FSC certified forest. However, this success could not be achieved only by its own efforts; house builders

who demanded FSC-certified timber from YFOC played an important role. Notably, most of those builders are ecology-oriented and use the traditional post-and-beam construction method.

Research Method

Usually, small local house builders purchase timber from retailers nearby. There are several advantages of buying timber from retailers, including lower transport cost, quick response for customer's order, and wide variety of product stock. Therefore, purchase of timber directly from a distant sawmill like YFOC, located in a remote mountainous area, would seem unreasonable for house builders in urban areas. In order to investigate the reason why particular builders require FSC-certified timber from YFOC, the author interviewed six such house builders in Osaka City and Kochi City.

Table 3 summarizes the basic information of the six house builders who obtain FSC-certified timber directly from YFOC. These are mainly small companies with about 10 or fewer employees, located far from Yusuhara. Osaka is on Honshu Island, a distance of about 350 km; Kochi City is the capitol city of Kochi prefecture in which Yusuhara belongs, but the distance is almost 100 km from YFOC. Transportation of timber is limited to small lorry because there are no railroads or ports in Yusuhara, which is located in the middle of the Shikoku mountain range. Locations of Yusuhara Town, Kochi City and Osaka City are shown in Fig. 2.

Research Findings

Company A is an architect office in Osaka, specializing in wooden houses. This kind of architect office is not popular in Japan, because most of the house builders employ licensed architects in their own company. The president of this company is highly enthusiastic about building traditional post-and-beam houses using domestic

Table 3 Basic information of house builders buying YFOC timber

Company	Location	Foundation	Number of employees	Annual number of houses constructed	First deal with YFOC
A	Osaka	2000	3	4	2007
B	Osaka	1993	10	5–10	2002
C	Osaka	1981	7	10–12	2004
D	Kochi	1979	18	30–35	2001
E	Kochi	1956	13	8–10	2001
F	Kochi	1993	5	3–4	2003

Source: Interviews conducted in 2008



Fig. 2 Location of Yusuhara, Kochi, and Osaka

timber. He became acquainted with FSC and Yusuhara through professional association in 2005, and began to use timber from YFOC in 2007.

The most appealing point of using YFOC timber for company A is flexibility for difficult orders such as 6 m long posts or 8 m long beams. Such special materials are not easy to obtain from most retailers; in contrast the custom-made system of sawn timber production in YFOC makes sourcing of odd-dimension timber possible without extraordinary efforts. Another appealing point is assurance of where the timber comes from. Building houses by using domestic timber is the motto for Company A, so that knowing the timber source is highly important. Price of timber is also an appealing point for the company. Direct dealing with YFOC gives the company a short-cut relative to the normal distribution flow, hence the offering price is better for both YFOC and Company A.

Company B is a small but high class house builder in Osaka. Supplying healthy wooden houses without harmful materials such as formaldehyde in adhesives is their goal, e.g. the company does not use wallpaper but rather traditional plasters and vegetable paint. The first contact with FSC for Company B was a request from a customer who happened to watch a TV program about FSC forest certification in 2001. The customer wished to have a house built of domestic FSC timber, and requested Company B to build it. Company B searched for certified timber of domestic origin. There were only a few of FSC-certified forests in Japan at the time, and YFOC was one of them. YFOC accepted the offer from Company B, which was based in Osaka, several hundred kilometers from Yusuhara, and a new customer for them. YFOC gained an attractive business opportunity because of having FSC forest certification.

Traceability is the key to use YFOC timber for Company B. FSC requires strict traceability of certified timber, so that YFOC is able to assure customers that their timber is from their managed forest in Yusuhara Town. Such reliability of origin of the trees is important for customers, as well as the certification for environmentally sound forest management. Customers are satisfied with using FSC certified timber because extraction of those trees from the forest means nothing negative for the environment and society at the location.

Company B has obtained Chain of Custody (CoC) certification by FSC since 2003. It is a business strategy for the company to obtain reliability as an environmentally friendly builder for customers.

Company C is also a small builder in Osaka. It previously constructed reinforced concrete (RC) buildings but changed materials because of awareness of environmental problems. The company believes that building wooden houses with domestic timber is environmentally sound business activity.

Company C established a business partnership with YFOC and has used only FSC certified timber from YFOC in their all housing construction in recent years. Once or twice a year, they take customers to Yusuhara to inspect standing trees and forest management there. To know where the timber of the house comes from is very informative and exciting for customers. The centre post of the house is the most important timber in traditional post-and-beam construction. Customers are able to see a big standing tree in the forest which will be their house's centre post; it must be a magnificent experience for the family members of the customers to see the living tree of their future house material.

Company D is a relatively large builder in Kochi City, and is one section of a parent company which runs DIY shops, car equipments shops, and pet shops. The company has about 420 employees, with 18 in the house-building section. Carpenters are not directly employed by the builders' company, but nine teams of carpenters are working for company D on a contract basis. This type of relationship between house builders and carpenters is common in Japan.

Company D is particularly sensitive to the environment. The parent company has been planting trees on the mountains, and has been cleaning public toilets and roads for many years as a corporate social responsibility. The activities of this company are famous in Kochi. The idea of FSC forest certification matches their company's philosophy, so that company D is willing to use certified timber from YFOC in their housing construction. Presently, company D is the biggest client for YFOC, and they consistently build more than 20 wooden houses a year using FSC timber.

They are also willing to accept orders for reconstruction of old wooden houses. Building new houses is still very common for young families, but some people like to reconstruct old houses due to their antique value and environmental friendliness. Such customers are likely to choose Company D as their builder because the idea of using environmentally sound FSC-certified timber suits them.

Company E places great importance on quality of timber in their construction. For instance, annual ring density and surface colour as well as appropriate timber drying are of importance for them. Like company B, healthy housing is the target for them. Traceability of timber is a major reason for them to use FYOC timber, but the biggest reason is cost advantage from direct dealing with the FYOC sawmill.

Sawn timber price is determined by negotiation with YFOC and the buyer. Therefore, the price will change between deals. YFOC asks their selling price based on the cost of production, and the buyer usually accepts the price. Because the price offered by YFOC is lower than that on the timber market or retailers, the buyer need no or a little negotiation. However, Company E is always looking for local sawmills which can provide less expensive timber with the same or higher quality as YFOC, and they often purchase non-certified timber from other sources.

Company E is somewhat critical for FSC and YFOC. FSC timber will be willingly accepted by environmentalists, but the majority of the customers may not need certified timber because they do not perceive such a high value in it. Company E will continue to use YFOC timber as long as the quality and price are acceptable. The president of the company takes the view that the quality of the house depends strictly on the quality of timber used, and so favours high quality timber rather than environmentally friendly but lower quality timber. Hence it is important to realize that forest certification is proof of environmental quality of forest management but not an evaluation of timber quality to any degree.

Company F is a unique builder which constructs log houses with the post-and-beam construction method which is new in Japan. This construction method requires a large quantity of logs and sawn timber. Log houses are highly artistic compared with usual wooden houses, so that traceability of wood is important for the company. FSC logs and timber are suitable for their nature-oriented concept of log house building. They obtained CoC certification in 2003, and have strongly supported FSC in their activities.

The company builds three to four houses annually, hence the total amount of logs and timber used is small, but they request highly specific characteristics of wood. For example, they would need a 12 m long and slightly curved main beam log of more than 30 cm diameter. It is almost impossible to find such a special material at wholesalers or timber auction markets. Therefore, the president of company F goes to the forest in Yusuvara Town with his friend who owns some forest or with YFOC officers and chooses a particular standing tree for his purpose.

Company F often participates in competitions in log house building in Japan. Design and workmanship are the most important points of the evaluation, but log houses built by Company F, which is using only FSC-certified lumber from Yusuvara, receives high scores in competitions because of their environmentally sound concept.

Discussion

It is interesting that FSC-certified timber is demanded by traditional wooden house builders in urban areas. Why is this international certification scheme chosen by such small builders rather than big housing companies? Analyzing the interviews with six builders and YFOC, several reasons for using FSC certified timber from YFOC are found. Traceability of timber is the most important factor; FSC requires 100% traceability of all the logs from forest to stock yard or sawmill. Therefore, timber from YFOC is highly reliable in terms of the origin of the timber. This is a

special feature of YFOC timber compared with domestic timber sold by most retailers. All the builders interviewed answered that traceability is an important reason of using timber from YFOC regardless of the distance to obtain the timber.

Another important factor is timber price. YFOC timber is less expensive for house builders than timber from retailers located near them. Both YFOC and house builders enjoy economic gain by omitting intermediary agents. Most of the builders answered that price is an attractive reason of using timber from YFOC.

Environmentally sound forest management of YFOC is another selling point for builders and customers with high priority on environment. As an environmental certification, FSC can be a proof of reliability of the company and users of certified products. All but one of the builders answered that environmentally sound forest management is an important reason of using timber from YFOC. For ecology-oriented house builders, FSC-certified timber is one of solutions that they might seek.

Finally, quality of timber from YFOC is a critical factor. This is not directly related to FSC, because FSC is not a certification system for physical quality of timber. Actually, most of the builders appraise the quality of YFOC timber, but some not. High quality here also means the quality of sawmill operation by YFOC.

All of these factors for choosing YFOC timber are easy to understand. Especially, traceability of timber is significant for customers because the tree itself is highly important for Japanese wooden houses. The fact that some builders take their customers to Yusu-hara on holidays to see the forest before cutting timber for their houses is a typical example of the unique significance of traceability of timber for housing in Japan.

Of course, there are some difficulties. Production capacity of the YFOC sawmill is several thousand cubic metres per year and is not easy to expand at present. Producing sawn timber for 80–100 houses per year is the maximum capacity of YFOC. Even though they receive orders for a greater quantity, they are not able to accept all orders. They already expanded their sawmill facilities in 2004 and 2005, and have no plans to expand further under the unstable current economy.

Decrease in sawn timber yield rate is another difficulty for YFOC. Because of maintaining the quality of their products, the forest yield rate has fallen in the last few years, reducing sawmill profitability. However, to recover the loss from sawn timber production, they launched a pellet factory adjacent to the sawmill. Energy use of non-commercial thinnings and sawmill residue is a new business for YFOC.

Concluding Comments

Demand for YFOC timber with FSC certification is increasing. Under the situation of a shrinking housing market in Japan, this is an encouraging event for small-scale forest owners. After YFOC gained FSC forest certification in 2000, some other forest owners' cooperatives followed. Ten out of 28 forest management certification holders in Japan are forest owners' cooperatives as of February, 2009. Obtaining FSC certification has created many opportunities to develop businesses using certified timber like that of YFOC for other organizations.

There is a movement of new thinking about housing taking place in Japan. Healthy housing against the *sick house syndrome* is one such trend, and building houses with local wood is another. High quality and safety of houses are required by the public. Traceability of timber as well as food is therefore becoming more and more important.

Wood mileage or argument of transport distances is another example of such a trend. Thinking about energy consumption or CO₂ generation, transportation of wood should be minimized. Using domestic wood, or even local wood, is the answer for people concerned about global environment. FSC certification is an effective tool for verifying transport distance from the forest to the house because of the traceability required by the system. Using FSC timber for traditional wooden housing in Japan is an interesting matching of international standards and local knowledge.

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